IMPACT OF THE INTERNET ON PROCUREMENT

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We believe that Internet and related technologies will change the role of the purchasing department from a transaction-oriented function to a more managerial function focused on establishing and maintaining relationships with suppliers, third parties, and internal customers, and leveraging corporate buying power. In its new role, procurement will also manage the technological infrastructure necessary to either automate transactions fully or to empower end users to perform many transactions without the direct involvement of the purchasing personnel. These trends have major implications for procurement processes, policies, and technologies, and will change management approaches. We'll survey the state-of-the-art and trends in Internet-based procurement systems, and discuss the results of a recent empirical survey we conducted.

Emerging technologies, such as the newly commercialized Internet and its hypertext-based multimedia-supporting spinoff, the World Wide Web, are raising high hopes of finally changing the picture of costly, time-consuming, and inefficient procurement processes by enabling major improvements in terms of lower administrative overhead, better service quality, timely location and receipt of products, and increased flexibility. With most organizations spending at least one third of their overall budgets to purchase goods and services, procurement holds significant business value (Zenz and Thompson, 1994; Killen and Kamauff, 1995). Growing pressures from increasingly open and competitive markets and increasingly tight budgets in the public sector reinforce the need to reorganize and streamline inefficient procurement procedures.

Although there is some tradition of information technology (IT) in procurement and increasing use of electronic data interchange (EDI) systems by the government and state agencies, especially, most information processing and communication around purchasing are still based on paper and telephone. Available IT systems usually do not cover the full process or are very expensive to set up. Internet and World Wide Web-based applications promise alternatives that are cheaper and easier to set up. In fact, they have the

potential to trigger even more radical changes. Consequently, even traditional users of EDI for procurement are facing significant reengineering and change management challenges.

This article addresses how Internet- and Web-based technology will affect the procurement function. The evolving nature of the field still leaves many questions open and procurement managers frequently wonder whether or not to jump, and onto which bandwagon. After providing an overview of procurement processes and some of the activities that organizations had undertaken to improve performance prior to the advent of the Internet, we take a look at currently available Internet- and Web-based technologies, and the opportunities they open. We also present some short scenarios of what the field of procurement may look like in another decade. In the section "Impact of the Internet on Procurement," we consider the user (buyer) side and present the results of a field study of both companies and government institutions that we conducted in 1997.

Procurement in state and federal organizations, a large part of it military, is somewhat distinct from procurement in private enterprises, because public institutions often have different objectives and constraints. Since they are not profit oriented, but, rather entrusted with tasks of public interest, they face far more regulations than private corporations concerning bidding and purchasing procedures, and are usually under closer public scrutiny. However, the government and corporate activities are intertwined in many ways; indeed, the government procures large quantities of items from private enterprises. Corporate America, on the other hand, has learned much from research and advances in public procurement and logistics, especially in the military sector. In the area of nonproduction procurement, such as office supplies, the practices of government entities and private companies are fairly similar, and the results reported in this paper are applicable to both.

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BACKGROUND

PROCUREMENT

Procurement encompasses all activities involved in obtaining material and services and managing their inflow into an organization toward the end user. It includes obtaining manufacturing supplies for an assembly line as well as obtaining paper and pencils for a bank (Hough and Ashley, 1992; Zenz and Thompson, 1994). Positioned between an organization's internal customers in need of material to fulfill their tasks and external suppliers providing goods and services, this function has to bridge multiple gaps in order to simultaneously manage external and internal relationships, and to balance participants' different goals.

Purchasing—that is, the act of buying goods and services—can be divided into three basic steps: information, negotiation, and settlement (Zenz and Thompson, 1994).

- Information. Prospective buyers identify their needs and evaluate potential sources to fulfill them, gathering information about market conditions, products, and sellers.
- Negotiation. Individual business partners start to interact with each other and determine prices and availability of goods and services as well as delivery terms. Successful negotiations are usually finalized with a contract.
- Settlement. The terms of the contracts are carried out and goods and services

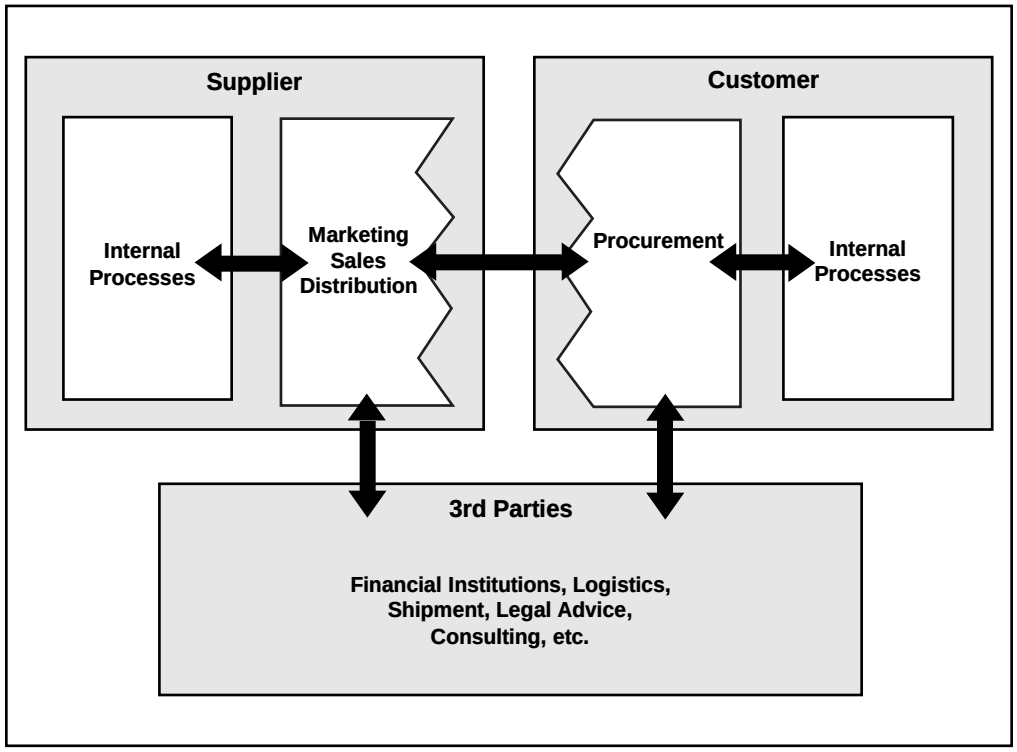

Figure 1. Procurement: Spanning Multiple Boundaries

are transferred in exchange for money or other forms of compensation.

For a richer, more detailed framework see Nissen (1997). The simpler framework is sufficient for discussion purposes and allows us to highlight the electronic commerce developments which are applicable to each of the steps. Procurement processes take on many different forms in reality. Using the types, uses, and the value of the goods purchased, we distinguish between three categories (Hough and Ashley, 1992; Zenz and Thompson, 1994).

- Procurement of raw material and production goods is usually characterized by large quantities, high frequencies, and important and unique specifications; just-in-time (JIT) delivery is often critical.

- Procurement of maintenance, repair, and operating (MRO) supplies is usually characterized by low unit cost and low volume, but relatively high frequency; examples include janitorial and office supplies.

- Procurement of capital goods and maverick procurement means dealing with goods of high value at low frequency (e.g., new factories) or procuring items outside the regular purchasing process, often because of convenience or speed requirements.

While manufacturing organizations emphase procurement of capital goods and raw material, the (growing) service sector, including the government and military, accentuate capital goods and MRO procurement. This paper focuses on MRO procurement, although the IT and changes we address will doubtless touch all three types of procurement. There are several reasons for this. First, we feel that production procurement has already received a large amount of study and attention, and tends to be relatively advanced compared to the other two types. Second, the dollars spent (or saved) in MRO procurement count as direct cost savings, a fact which has been generally under-appreciated. Third, we believe the radical change in IT will give rise to new market-spaces which may, at least in the shorter run, have the largest impact on MRO procurement.

Improving Performance

Most organizations want to manage procurement with the lowest possible levels of risk and investment while still ensuring adequate quality, avoiding duplication and waste, and sustaining the organization's competitive position and outside image (Perlman, 1990; Zenz and Thompson, 1994). While qualitative measures like the level of customer satisfaction or the quality of supplier relationships are emphasized by corporate managers and match strategic requirements, they are relatively hard to gauge. Many purchasing managers prefer more operational transaction-oriented measures like cost, speed of reaction, or delivery time (Fearon and Bales, 1997). Although the biggest payoffs are usually achieved when different methods such as organizational changes and IT are used together to comprehensively reengineer a process, the bottom line results might still be gauged in terms of quantitative measures, such as cost and lead time (Taylor, 1997; Hammer and Champy, 1993).

Purchasing policies and forms are among the most common instruments to standardize and control the purchasing process (Perlman, 1990; Zenz and Thompson, 1994). To cover the wide range of possible situations, however, organizations usually use a large number of rules, and resulting procedures are often complex, slow, and expensive.[1] Another common option to improve procurement performance is the attempt to leverage buying power through central sourcing (Scheuing, 1997), by issuing blanket orders (Zenz and Thompson, 1994), or by establishing close relationships with a selected set of suppliers (MacDuffie and Helper, 1997).

With buying processes typically involving a large amount of information processing and communication, procurement is well suited for IT support and automation throughout all its steps. However, prior to the advent of the Internet, available IT systems often supported only the information phase of production and nonproduction procurement (electronic catalogs) or automated operational activities during the settlement phase, including payment, especially in cases where high volume and frequency justified the high setup cost (EDI) (Sokol, 1995). Systems were often proprietary and not very interactive. Generally, little IT support can be found for the negotiation phase, as well as in capital and maverick buying, where processes are mainly paper-based and done manually (Oliver, 1996; Segev and Beam, 1997).

Now we will address the newest IT—that is, Internet- and World Wide Web-based systems—to explore how it can change procurement, and look at its chances to do so, addressing the question of acceptance among purchasing organizations.

Potential of the Internet to Revolutionize Procurement

Much has been written and said about the potential of the Internet to revolutionize the way business is done. In this section, we will take a closer look at that statement by first outlining the unique characteristics of the Internet, and then providing an overview on the state of the art of Internet-based procurement systems. We will also provide a tentative, futuristic look at the way procurement might be conducted a decade hence, using the characteristics of Internet-based technologies as the guide.

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Characteristics

The Internet, this network of information networks with tens of millions of users worldwide, has some characteristics that make it a very powerful influence on the business world as well as the private sector (Ware, Gebauer, Hartman, and Roldan, 1998):

- ***Ubiquity and connectivity.*** The number of Internet and World Wide Web users is growing steadily, as is the intensity with which emerging technologies are used. As a result, the Internet

is becoming a very flexible and powerful method for organizations to connect with business partners and to access information electronically.

- ***Immediacy and interactivity.*** Internet- and Web-enabled technologies not only make information available to others instantly, they also facilitate instant interactivity, especially when compared with traditional communication media, such as paper documents, fax, and electronic systems like EDI.

- ***Multimedia.*** The World Wide Web supports the exchange of information in a broad variety of formats, ranging from text and graphics to sound and video clips, and thus enables the transmission of very complex information.

- ***Universal interface and ease of use.*** The Internet's open standards architecture manifested in platform independent browser technology helps to overcome the limits of proprietary and closed systems by facilitating data processing and exchange across different technology platforms and different performance capabilities. Additionally, Web browser-based point-and-click interfaces are end user-friendly.

INTERNET-BASED PROCUREMENT SYSTEMS

The features just described give Internet and Web-based systems the potential to support all aspects of procurement:

- Internet search engines help users find items by using keywords supporting the information phase, in particular to find new sources or to fulfill unexpected requirements.

- Internet-based catalogs allow buying organizations to browse, search, and place orders on-line. They combine and extend many features of existing channels, such as the rich content of printed catalogs, the convenience and intimacy of on-line shopping, and the sophisticated searching capability of CD-ROM catalogs. They also let suppliers provide different "faces" to different buyers, and allow all parties to immediately track orders electronically (MacDuffie and Helper, 1997; Perlman, 1990).

- Internet-based EDI links can be less costly than the traditional leased lines and value added services regarding network access and data transmission. As a result, the break-even point in terms of transaction volume becomes lower, especially favoring smaller organizations (Gebauer, 1996). The special features of the Internet and the Web allow the development of interactive applications, enhanced by a graphical user interface with full multimedia support, and thus enable the communication of complex information.

- A growing number of Internet-based on-line auctions and bidding systems supports the negotiation phase by providing a simple negotiation mechanism confined to price alone (Gebauer and Hartman, 1997; Wilder, 1997). Their success is a testimony to the ease with which the Internet connects a large number of dispersed users.

- The most vivid developments in Internet-based procurement systems are probably happening in the area of

MRO procurement, where numerous organizations and initiatives are trying to be the first to present viable business models and software.[2] They are developing systems that let buyers combine catalogs from several suppliers, check the availability of items, place and track orders, and initiate payment over the Internet. Vendors realize the need to streamline procurement processes and to push systems beyond pure transaction processing by adding workflow elements. By integrating individual organizations' purchasing and approval rules, it becomes possible for procurement to let end users do individual purchases, while maintaining control over the process.

New technologies clearly show the potential to trigger significant changes in procurement. The majority of currently available off-the-shelf systems, however, is in a very early stage. Most search engines are not yet sophisticated enough to help locate information in an efficient way. A lack of common standards prevents the easy integration of electronic catalogs from different suppliers and the development of highly valuable "meta-catalogs" (Bichler and Hansen, 1997; Catalogs, 1997). Flaws regarding security and reliability as well as a lack of adequate systems (e.g., to support payment in a flexible way) hinder the widespread use of Internet-based EDI systems. "New generation" MRO procurement systems have yet to prove their viability beyond the pilot stage.

Several organizations have coped with lack of readily available systems by developing high-performance applications in-house. In this context, government organizations play a leading role.

The Defense Logistics Agency (DLA) and the U.S. General Services Administration (GSA) both have developed Web-based systems for the procurement of commodities, MRO supplies, and services. Users in military and federal agencies can now browse electronic catalogs from a multitude of suppliers, review delivery options, place orders on-line, and pay via corporate credit card. Both projects are remarkable alone because of their size: DLA's system holds nearly 4 million items and GSA estimates the current transaction volume handled by the system will double to $55 to $60 million annually by September 1998. Besides, the sophisticated built-in security and payment mechanisms may well serve as models for private corporations and other government agencies. In both cases, the IT systems enabled major changes in the way procurement is done. The central procurement agencies established a general infrastructure in terms of procurement procedures, overarching contracts with suppliers, and the Web-based system that empowers end users to handle purchasing operations by themselves. As a result, purchasing lead times and the related administrative overhead have dropped dramatically.

"New technologies clearly show the potential to trigger significant changes in procurement."

Lawrence Livermore National Laboratories (LLNL) developed a Web-based system for the procurement of prototype parts (Jordan et al., 1997). The approach is remarkable because it is in an area that is usually not well supported by IT but where the overhead costs often surpass the value of the items purchased. Although the

process lead times were frequently unacceptable, EDI was not an option due to infrequent demand patterns and the complexity of the items. The new system supports the entire workflow, from the end user requesting an item through all the steps of setting up and handling a request for quote (RFQ) to the final payment. While the technical specifications for the parts are stored on LLNL's Web server, individual actions are triggered via e-mails internally (e.g., for approval) as well as between LLNL and its suppliers. Setting up secure areas and individualized access rights turned out to be an essential part of the system. With its built-in approval processes and other features ensuring compliance with LLNL's procurement policies, the system, like the systems of DLA and GSA, allows end users to circumvent the procurement department for routine operations. Direct IT-based communication between the "technical experts" (i.e., the end user and the parts supplier) greatly improves the purchasing processes in terms of cost, speed, and errors.

"Automated negotiations and electronic auctions are other areas where big gains have yet to be reaped."

These examples can be considered as first steps on the way to more substantial changes. The next section outlines some scenarios that could be enabled by emerging technologies. Their actual implementation and broad acceptance, however, will not only depend on the availability of the technical solutions, but also on the bottom-line value that they will eventually provide to all prospective user organizations.

A Peak Into the Future

Learning from the impact that the deployment of innovative systems and applications already have had on some organizations, we envision even more radical changes to business practices and organizational structures over the next years as electronic commerce solutions become more mature and more widespread. As a general development we see the role changing between end users and the procurement function consolidate, i.e., new procurement systems will continue to either automate purchasing operations or help push them down to the end user, allowing the purchasing department to concentrate more on strategic and managerial tasks. Automated negotiations and electronic auctions are other areas where big gains have yet to be reaped.

- Starting out with standardized goods, especially MRO supplies, electronic auctions might start to play an important role in many more different market-spaces than today. Involving suppliers and bidders worldwide, they would repeat in real-time, so a prospective purchaser could dial in and see the spot price of paper, chairs, or janitorial supplies and determine whether to purchase now or to wait a while for the price to possibly become more favorable. As more sophisticated description methods evolve, next-generation auctions will also feature more complex items and allow matching of supply and demand not only with respect to price, but also for features such as service quality or speed of delivery.

- Writing up an electronic RFQ and submitting it to the electronic market-

space in general will become easy for buying organizations. Suppliers would be able to electronically contact each other, negotiate a team-based approach, and automatically respond to the RFQ.

- An organization with several decentralized small buyers of the same goods would be able to combine the orders and to leverage its purchasing power to negotiate for the best price, using for example intranet-based internal Web forms for consolidation. The same concept can also be applied in inter-organizational settings where a third party or buying association would act as an intermediary leveraging buying power for smaller and medium-sized organizations using the Internet and Web for communication and as a tool for sourcing.

Ideally, IT will support or even automate all different kinds of procurement procedures across entire organizations by routing technical specifications, approval forms, and payment instructions according to internal policy constraints, external requirements, and market opportunities. As a result, purchasing departments will eventually become composed of mostly managers and systems integrators, and less of clerks, secretarial staff, and administrative support. Additionally, the determining factor of geography will diminish, freeing organizations to obtain the best deal and the most appropriate products from anywhere on the globe.

Although our peek into the future is based on some developments that are already visible, their newness and the immaturity of available technology and standards make it very difficult to forecast future developments. It is not clear what future Internet-based procurement systems will look like and how well they will be accepted by buying and selling organizations, whether common standards will evolve and what they will look like, and what the resulting changes in procurement processes will eventually be. To offer a starting point and to help overcome the current lack of empirical data necessary to answer these questions, we conducted a field study among buying organizations. The next section outlines the design of the study and discusses its results.

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Impact of the Internet on Procurement

Research Questions and Field Study Design

In early 1997, the Fisher Center for Management and Information Technology at the University of California, Berkeley, started an extended field study, partly in cooperation with CommerceNet and the *Journal of Internet Purchasing* (Segev, Beam, and Gebauer, 1997). Among others, the study attempts to answer the following research questions:

- What is the current state of the practice in purchasing concerning the use of IT in general and the Internet in particular?

- What are the requirements of the procurement function and what is the perception of the Internet's potential to help improve procurement?

- What types of relationships do organizations currently have with their suppliers and how might the Internet change this picture?

- Can we isolate organizations that are "leaders of the pack" in terms of IT use in their procurement function? Which factors differentiate them from the rest of the sample?

- What are the obstacles to purchasing on the Internet?

As a first step, we conducted an empirical survey among buying organizations using a Web-based questionnaire and gathered additional knowledge from telephone conversations with purchasing managers, case studies, and literature research. The results reported here are based on 60 responses, which we collected primarily between April and July 1997. The small sample limits the depth of possible interpretation of the results, as does the fact that it is somewhat skewed toward organizations that can be considered rather open towards the use of emerging technologies. This is due to many factors, including the fact that only Web-capable organizations could fill out our on-line survey form,[3] and organizations that took the time to respond to the survey were likely to have made IT use in procurement a priority.

The participating organizations cover a broad range of business types, with computer software (15 percent), manufacturing (13 percent), and government (12 percent) accounting for the biggest chunks. More than two-thirds (35 percent) of the participants identify themselves as primarily manufacturing organizations, while 65 percent are primarily service businesses. Based on a compilation of annual sales, number of employees, and annual purchasing volume (Table 1), 28 percent are small organizations; 24 percent are medium, and 40 percent are large organizations.

Table 1. Size Categories[a]

Size	Annual Sales Volume	Number of Employees	Annual Purchasing Volume
Small	$10 M or less	500 or less	$1 M or less
Medium	$10 M to $1 B	500 – 10,000	$1 M to $50 M
Large	$1 B or more	10,000 or more	$50 M or more

[a] Organizations were ranked according to the majority of the categories into which their annual sales volume, number of employees, and annual purchasing volume fell. In cases of doubt, we prioritized the annual purchasing volume.

RESULTS AND DISCUSSION

Current Purchasing Practices as They Regard IT Use. The responses to our survey show that procurement is still far from being revolutionized by the Internet. While "conventional" IT such as electronic catalogs as well as EDI systems are in use at half of the participating organizations, there is no broad adoption of Internet and Web-based technologies. To date, most of the communication between buying organizations and their suppliers is not even IT supported, the phone and fax machine being the most important means of communication. Even relatively inexpensive electronic systems such as e-mail were quite frequently rated as not very important. In some cases, participants reported that they were unable to fill in the survey on-line because the procurement function only had access to very few Web stations, which were not available for such tasks.

Although business-to-business (B2B) applications are not yet in widespread use (Figure 2), 31 percent of the responding organizations plan to increase the number of electronic links over the next 12 months by at least 20 percent. This indicates not only a potential increase for the use of Internet technologies, but also a starting point for raising awareness among organizations about possible applications.

Analyzing the functionality of B2B applications in more detail reveals that larger organizations are more likely to have systems in place that allow the electronic transfer of data, JIT replenishment, and suppliers' access to internal data and that integrate B2B applications with internal systems. Manufacturing organizations report more often that they allow

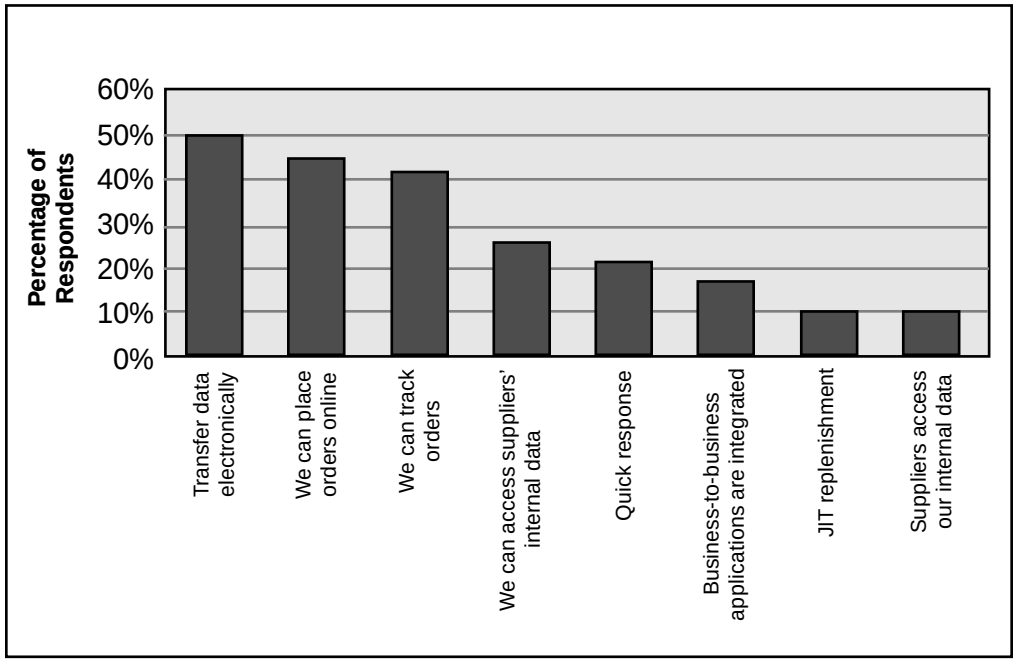

Figure 2. Functionality of Business-to-Business Applications

suppliers to access their internal data, while service organizations are more often the ones that have access to suppliers' data and report that they can place and track orders on-line.

Requirements of the Purchasing Function and the Role of the Internet. To learn more about the requirements of the purchasing function, we asked respondents to list the three most important measures of success of the purchasing department and to rate the department's success with respect to that measure. We summarized the answers in categories (Table 2). The results clearly show the importance of issues such as cost, time, (internal) customer satisfaction and quality, and also the difficulty of managing cost control and time issues.

Although the current use of the Internet is weak, the general attitude of our participants toward its use is positive and indicates confidence that it will help to improve procurement. The majority believes that the Internet will increase the efficiency of the supply chain by facilitating inter-organizational information sharing (66 percent), that it will reduce the length of the supply chain by making it easier to locate suppliers (60 percent), and that it will help handle situations of exceptional demand better (57 percent).

Impact of the Internet on buyer-supplier relationships. Almost half of the participants (47 percent) indicate that most or all of the relationships with their suppliers are moderately distant, so neither very close nor very distant relationships prevail. Larger organizations generally have closer relationships than smaller ones. High setup costs for electronic links, as they are typical for EDI and JIT

Table 2. Purchasing Success Categories

Rank	Measurement	Interpretation	Importance[a]	Success[b]
1	Cost	Cost of items purchased as well as total cost of ownership	91	3.14
2	Time	Timely delivery, fast order processing	66	2.97
3	Satisfaction	Internal customers (can be broken into price, quality, and order fulfillment, i.e., accuracy and time to fulfill), selection, and characteristics of the internal process itself (friendliness of the people, etc.)	57	3.52
4	Quality	Ability to provide high-quality goods	43	3.11
5	Stock	Inventory management and ability to keep high (sufficient) stocking	26	3.25
6	Value	Value delivered to the organization	24	3.00

[a] We weighted the answers according to the following ranking system: A first-place performance measure was given 3 points; a second-place was 2 points, and a third-place measure was given 1 point.

[b] Success is rated on a scale of 1 (unsuccessful) to 5 (extremely successful).

systems, can be better justified in the case of close links with a business partner, since they foster trust in an ongoing relationship. Consistently, these systems are more frequently in place at larger organizations than at smaller ones. For smaller organizations, the Internet promises to link them more closely with their suppliers. They hope it will help them achieve the close and interwoven relationships that larger organizations have in place already, at lower setup costs and less organization-specificity than is required by other technologies (such as EDI) over private leased lines.

We asked the participants about their perception of how the Internet will affect the relationships with their suppliers and generally affect procurement. The answers were not at all uniform, which might be due to the newness of the medium. Thirty-three percent believe that regardless of past events, the Internet will decrease the number of suppliers over the next 5 years. Thirty-seven percent believe the number of suppliers will actually increase, while 27 percent believe there will be no impact. While small organizations think the Internet will rather increase the number of their suppliers, medium sized and large organizations tend to expect a decrease or no impact.

IT leaders: Are they different? Oftentimes, valuable lessons can be learned from the actions of early adopters of new technology. We divided the responding organizations into four major groups (leader, moderate, little, and very little), using the degree of sophistication and integration of their IT systems as the criteria.[4]

The leaders are about evenly spread between organizations of all sizes. They seem to be slightly more prevalent in service, rather than in manufacturing industries, where half of the sample was in the "very little" category. The leaders and moderate users of IT also appeared to operate in less stable environments than did the organizations which used little or very little IT in purchasing. We need more research to answer the question of whether unstable environments require more use of IT to adapt, or if the unstable environment and increased use of IT in the purchasing function are both effects of some other root cause.

Another interesting suggestion here is that the leaders more often have written and detailed purchasing procedures in place, which they follow more closely than the other groups. This could reflect necessary planning before an information system can be implemented, or perhaps an overall management commitment to purchasing. Either way, the leaders in IT usage appeared to be also leaders in procurement policy planning and execution.

"Oftentimes, valuable lessons can be learned from the actions of early adopters of new technology."

There also appeared to be a small difference between the groups with respect to purchasing priorities. For the leaders, quality was the most important measure, while for the other organizations, cost was the most important measure. It is also interesting to note that the leaders did not rank customer satisfaction among their top three, whereas the other three groups did. Perhaps this indicates the leaders are trying to satisfy other criteria; it could also mean that "quality" encompasses customer satisfaction.

Obstacles to purchasing on the Internet. What stands in the way of increasing the use of the Internet and other emerging technologies, and eventually helping to move the procurement function from a transaction-based orientation to a more strategic viewpoint? The comments of our participants and the survey data showed that the immaturity of technology is a largely inhibiting factor, but not the only one. The most commonly named obstacles are:

- security concerns;
- inefficiencies in locating information; and
- lack of adequate tools and systems.

Organizations also find it is difficult to change current organizational systems that rely extensively on interpersonal communication (telephone, face-to-face, fax, etc.). Many organizations have widely differing systems in place for different suppliers. This lack of interoperability and the lack of standards make it difficult to pull all buyers and suppliers together into a single protocol or a few market-spaces for buying and selling. Despite steady growth, the current use of Internet-based technologies has not yet reached critical mass. Organizations willing to communicate via e-mail often find their business partners not yet capable of receiving messages.

"Although Internet-based procurement systems have not yet been adopted on a broad scale, the general attitude of buying organizations is positive and inquisitive."

Additionally, there may be a lack of top management support and vision. This is understandable, because not even researchers and market analysts are yet sure of the exact direction electronic purchasing will move. All these obstacles are both technical and managerial, and cannot be simply solved by a fast Internet connection or yet another departmental reorganization.

Conclusions and Areas of Further Research

Although Internet-based procurement systems have not yet been adopted on a broad scale, the general attitude of buying organizations is positive and inquisitive. They are beginning to realize the potential of emerging technologies to change corporate procurement; smaller organizations, especially, now see the chance to establish electronic links with their suppliers in ways that were once reserved for large players. Especially "new generation" MRO procurement systems promise to bring organizations one step closer to a scenario of integrated, yet modularized systems, which are flexible enough to handle all the different kinds of purchasing routines an organization usually has in place. Built upon open standards, emerging technologies also promise flexibility when it comes to adding or changing new functions and partners in order to keep up with changing business requirements.

In line with "historic" business process reengineering projects, benefits can be reaped not only by automating operations, but maybe even more from developing an infrastructure of empowerment for end

users. Letting them "shop on their own" will leave the procurement department with more resources to focus on strategic tasks (e.g., establishing and maintaining close relationships with suppliers and business partners), eventually leading to streamlined processes and leveraged buying power. In order to overcome the limits to empowerment, since end users are not always keen on "having to do the work," ideal new systems might give them a choice.

Since currently available systems are far from mature and not even all aspects of procurement are covered yet, the advent of the "brave new world" depends heavily on issues like the availability of manageable technology and whether organizations actually realize the benefits of deploying it. Academic research will continue to play an important role in raising awareness and spreading news of innovative applications, as will the trade press and industry associations. Given that technology changes at a very fast pace and systems that create sustainable competitive advantage will always require some customization in order to provide unique value, organizations need to consider their Internet plans as part of a larger strategy. Developing applications using new technology for the sake of it will surely initiate the legacy systems of tomorrow—that is, fancy "islands of Webification."

More research is needed to fully answer our research questions. Close interaction among all market participants (suppliers, buyers, and technology vendors) is necessary to continuously identify technology requirements and, subsequently, to develop systems that provide bottom-line value and thus incentives for adoption by all parties. We will intensify our current field studies by collecting more data points and performing deeper data analysis, as well as compiling additional case studies. We will also extend it by including the suppliers' side of the picture and learning about their requirements and intentions to participate in the adoption of current systems.

ENDNOTES

1. At the University of California, for example, processing a purchase order runs over $200 on average.

2. For example, Actra Business Systems, Elekom, Ariba, and CommerceOne.

3. We did offer paper-based and e-mail versions of the questionnaire.

4. Evaluation criteria were the use of e-mail, file transfer, EDI, electronic funds transfer, and electronic catalogs, the percentage of transactions done with business to business applications, and the sophistication of electronic networks an organization participates in.

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